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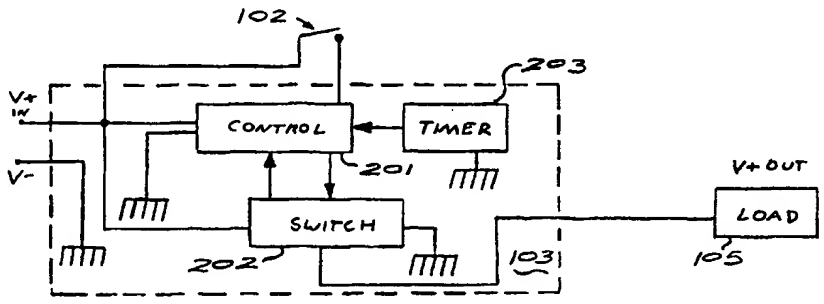

(57) Abstract

The present invention provides for a unique microchip or circuit which can, *inter alia*, handle both current conducting functions and man–machine–interface functions in an electrical device, for example, such as a flashlight. The man–machine–interface functions, according to the present invention, may be controlled by very low current signals, touch pads, carbon coated membrane type switches, or other low current type switches. These low current switches are smaller, more reliable, less costly, easier to seal, and less vulnerable to corrosion and oxidation than prior art switches. Moreover, since according to the present invention, the current conducting switch is controlled in an intelligent manner by the same microchip which provides the man–machine–interface functioning, significant costs savings and reliability are achieved by the invention. The present invention, according to one embodiment, also provides a microchip or circuit which may be embedded into a power source, for example, a battery, that supplies intelligence to the same. As a result, and according to the invention, functions such as delayed switching, dimming; delayed automatic shut off and an intermittent activation may be realized in less intellligent prior art electrical devices. According to certain embodiments of the present invention, the inventive microchips or circuits of the present invention can, *inter alia*, adjust the average electrical current through a current switch , provide an "on" and "off" sequence which, in the case of a flashlight, can be determined by an operator and may represent either a flash code sequence or a simple on–off oscillation, delayed shut off function, dimming function, provide indication of power strength, and provide gradual oscillating current flow to lengthen the life of the operating switch and the battery, etc. The function can be selected by varying the time period which elapses between successive activations of a controlling switch.

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INTELLIGENT ELECTRICAL DEVICES

FIELD OF THE INVENTION

The present invention relates to new intelligent electrical current switching devices and more particularly, to microchip controlled electrical current switching devices. The invention further relates, in one embodiment, to intelligent batteries having embedded therein a microchip for use with a variety of electrical devices to add heretofore unknown functionality to existing electrical devices. The invention also relates, according to another embodiment, to intelligent hand-held electronic devices, and in a preferred embodiment to hand-held light sources, and more particularly, to flashlights. According to one embodiment of the present invention, the invention relates to intelligent hand-held flashlights having microchip controlled switches wherein said switches can be programmed to perform a variety of functions including, for example, turning the flashlight off after a pre-determined time interval, blinking, or dimming, etc. According to a still further embodiment, the invention relates to low current switches controlled by microchips of the present invention for use in building lighting systems.

BACKGROUND OF THE INVENTION

In conventional flashlights, manually-operated mechanical switches function to turn the flashlight "on" and "off." When turned "on," battery power is applied through the closed switch to a light bulb, the amount of power then consumed depends on how long the switch is closed. In the typical flashlight, the effective life of the battery is only a few hours at most. Should the operator, after using the flashlight to find his/her way in the dark or for any other purpose, then fail to turn it off, the batteries will, in a very short time, become exhausted. Should the flashlight be left in a turned-on and exhausted condition for a prolonged period, the batteries may then leak and exude corrosive electrolyte that is damaging to the contact which engages the battery terminal as well as the casing of the flashlight.

When the flashlight is designed for use by a young child the likelihood is greater that the flashlight will be mishandled, because a young child is prone to be careless and forgets to turn the flashlight "off" after it has served its purpose. Because of this, a flashlight may be left "on" for days, if not weeks, and as a result of internal corrosion may no longer be in working order when the exhausted batteries are replaced.

Flashlights designed for young children are sometimes in a lantern format, with a casing made of strong plastic material that is virtually unbreakable, the light bulb being mounted within a reflector at the front end of the casing and being covered by a lens from which a light beam is projected. A U-shaped handle is attached to the upper end of the casing, with mechanical on-off slide switch being mounted on the handle, so that a child grasping the handle can readily manipulate the slide actuator with his/her thumb.

With a switch of this type on top of a flashlight handle, when the slide actuator is pushed forward by the thumb, the switch "mechanically" closes the circuit and the flashlight is turned "on" and remains "on" until the slide actuator is pulled back to the "off" position and the circuit is opened. It is this type of switch in the hands of a child that is most likely to be inadvertently left "on."

To avoid this problem, many flashlights include, in addition to a slide switch, a push button switch which keeps the flashlight turned on only when finger pressure is applied to the push button. It is difficult for a young child who wishes, say to illuminate a dark corner in the basement of his home for about 30 seconds, to keep a push button depressed for this period. It is therefore more likely that the child will actuate the slide switch to its permanently-on position, for this requires only a monetary finger motion.

It is known to provide a flashlight with a delayed action switch which automatically turns off after a pre-determined interval. The Mallory U.S. Patent No. 3,535,282 discloses a flashlight that is automatically turned off by a delayed action mechanical switch assembly that includes a compression spring housed in a bellows having a leaky valve, so that when a switch is turned on manually, this action serves to mechanically compress the bellows which after a pre-determined interval acts to turn off the switch.

A similar delayed action is obtained in a flashlight for children marketed by Playskool Company, this delayed action being realized by a resistance-capacitance timing network which applies a bias to a solid-state transistor switch after 30 seconds or so to cut off the transistor and shut off the flashlight. Also included in the prior art, is a flashlight previously sold by Fisher-Price using an electronic timing circuit to simply turn off the flashlight after about 20 minutes.

It is also known, *e.g.* as disclosed in U.S. Patent No. 4,875,147, to provide a mechanical switch assembly for a flashlight which includes a suction cup as a delayed action element whereby the flashlight, when momentarily actuated by an operator, functions to connect a battery power supply to a light bulb, and which maintains this connection for a pre-determined interval determined by the memory characteristics of the suction cup, after which the connection is automatically broken.

U.S. Patent No. 5,138,538 discloses a flashlight having the usual components of a battery, and on-off mechanical switch, a bulb, and a hand-held housing, to which there is added a timing means and a circuit-breaking means responsive to the timing means for cutting off the flow of current to the bulb, which further has a by-pass means, preferably child-proof, to direct electric current to the light bulb regardless of the state of the timing means. The patent also provides for the operation of the device may be further enhanced by making the by-pass means a mechanical switch connected so as to leave it in series with the mechanical on-off switch. Furthermore, the patent discloses a lock or other "child-proofing" mechanism may be provided to ensure that the by-pass is disabled when the flashlight is switched off.

Most conventional flashlights, like those described above, are actuated by mechanical push or slide button-type switches requiring, of course, mechanical implementation by an operator. Over time, the switch suffers "wear and tear" which impairs operation of the flashlight as a result of, for example, repeated activations by the operator and/or due to the fact that the switch has been left "on" for a prolonged period of time. In addition, such mechanical switches are vulnerable to the effects of corrosion and oxidation and can cause said switches to deteriorate and to become non-functioning. In addition, these prior art devices having these mechanical switches are generally "dumb," *i.e.* they do not provide the user with convenient, reliable, and affordable functionalities which today's consumers now demand and expect.

The prior art switches typically provide two basic functions in prior art flashlights. First, the mechanical switches act as actual conductors for completing power circuits and providing current during operation of the devices. Depending upon the type of bulb and wiring employed, the intensity of electrical current which must be conducted by the switch is generally quite high leading to, after prolonged use, failure. Second,

these mechanical switches must function as an interface between the device and its operator, *i.e.* the man-machine-interface ("MMI") and necessarily requires repeated mechanical activations of the switch which over time mechanically deteriorate.

Also, currently the electrical switches used in buildings/houses for control of lighting systems are of the conventional type of switches which must conduct, *i.e.* close the circuit, upon command, thus also providing the MMI. These prior art switches suffer from the same disadvantages as the switches described above in relation to portable electronic devices, like flashlights. Moreover, the switches are relatively dumb in most cases and do not provide the user with a variety of functions, *e.g.* but not limited to timing means to enable a user, for example, a shop owner or home owner to designate a predetermined shut off or turn on point in time.

There is a need for inexpensive, reliable, and simple intelligent electronic devices which provide increased functionality and energy conservation.

SUMMARY OF THE INVENTION

According to one embodiment of the present invention, there is provided a microchip controlled switch to manage both the current conducting functions and the MMI functions in an electronic device, such as a flashlight, on a low current basis *i.e.* without the MMI device having to conduct or switch high current. According to one aspect of the invention, the MMI functions are controlled by very low current signals, using touch pads, or carbon coated membrane type switches. These low current signal switches of the present invention can be smaller, more reliable, less costly, easier to seal and less vulnerable to the effects of corrosion and oxidation. Moreover, since the switch is a solid state component, it is, according to the present invention, possible to control the functions of the device in an intelligent manner by the same microchip which provides the MMI functions. Thus, by practicing the teachings of the present invention, more reliable, intelligent, and efficient electrical devices can be obtained which are cheaper and easier to manufacture than prior art devices.

According to another embodiment of the invention, there is provided a microchip which can be embedded in a battery that will lend intelligence to the battery and thus, the device it is inserted into, so that many functions, including but not limited to,

delayed switching, dimming, automatic shut off, and intermittent activation may be inexpensively realized in an existing (nonintelligent) product, for example a prior art flashlight.

According to a further embodiment, the invention provides a power saving microchip which, when operatively associated with an electronic device, will adjust the average electric current through a current switch, provide an on and off sequence which, for example, but not limited to, in the case of a flashlight, can be determined by an operator and may represent either a flash code sequence or a simple on/off oscillation, provide an indication of battery strength, and/or provide a gradual oscillating current flow to lengthen the life of the operating switch and the power source.

According to one embodiment of the invention, an intelligent flashlight, having a microchip controlled switch is provided comprising a microchip for controlling the on/off function and at least one other function of the flashlight. According to a further embodiment of the invention, an intelligent flashlight having a microchip controlled switch is provided comprising an input means for sending activating/deactivating signals to the microchip, and a microchip for controlling the on/off function and at least one other function of the flashlight. According to a further embodiment of the invention, there is provided an intelligent flashlight having a microchip controlled switch comprising an input means for selecting one function of the flashlight, a microchip for controlling at least the on/off function and one other function of the flashlight, wherein the microchip control circuit may further comprise a control-reset means, a clock means, a current switch, and/or any one or combination of the same.

According to another embodiment of the invention, there is provided a battery for use with an electrical device comprising a microchip embedded in the battery. According to still a further embodiment of the invention, a battery for use with an electronic device is provided comprising a microchip embedded in the battery wherein said microchip is adapted such that an input means external to the microchip can select the on/off function and at least one other function of the electronic device.

According to one embodiment of the present invention, there is provided an intelligent battery for use with an electronic device, the battery having positive and negative terminal ends and comprising a microchip embedded in the battery, preferably

in the positive terminal end, for controlling on/off functions and at least one other function of the electronic device.

According to another embodiment of the invention, there is provided a portable microchip device for use in serial connection with a power source, *e.g.* an exhaustible power source, and an electronic device powered by said source wherein said electronic device has an input means for activating and deactivating said power source, and said microchip comprising a means for controlling the on/off function and at least one other function of the electronic device upon receipt of a signal from said input means through said power source.

According to a still further embodiment of the invention, there is provided a microchip adapted to control lighting in buildings. According to this embodiment, the normal switch on the wall that currently functions as both a power-switch, *i.e.* conduction of electricity, and MMI can be eliminated, thus eliminating the normal high voltage and high current dangerous wiring to the switch and from the switch to the load or light. Utilizing the present invention, these switches can be replaced with connecting means suitable for low current DC requirements.

According to another embodiment, the present invention is directed to a battery comprising an energy storage section, a processor, *e.g.* a microchip and first and second terminal ends. The first terminal end being connected to the energy storage section, the second terminal end being connected to the processor, and the processor being connected to the second terminal end and the energy storage section. The processor controls the connection of the second terminal end to the energy storage section.

According to another embodiment, the present invention provides an electronic apparatus which includes an electrical device, comprising a power supply, an activating/deactivating means, and a processor. The activating/deactivating means is connected to the processor and the processor is connected to the power supply. The processor controls the on/off function of the device and at least one other function of the device in response to signals received from the activation/deactivation means.

The present invention, according to a still further embodiment, provides a flashlight comprising a light source, an energy storage means, a switch means, and a processor means. The switch means being in communication with the processor means

and the processor means being in communication with the energy storage means which is ultimately in communication with the light source. The processor controls the activation/deactivation of the light source and, in some embodiments, further functions of the flashlight, in response to signals received from the switch means.

While the present invention is primarily described in this application with respect to either a flashlight or a battery therefore, the embodiments discussed herein should not be considered limitative of the invention, and many other variations of the use of the intelligent devices of the present invention will be obvious to one of ordinary skill in the art.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic of a device having a microchip controlled push button or sliding type input activation/deactivation switch according to one embodiment of the present invention;

Figure 2 is a block diagram of a microchip for use in association with a push button or sliding input activation/deactivation switch according to one embodiment of the invention;

Figure 3 is a schematic of a second type of intelligent device having a microchip controlled push button or sliding type input activation/deactivation switch according to another embodiment of the invention;

Figure 4 is a schematic of a device having a microchip controlled touch pad or carbon coated membrane activation/deactivation switch according to a still further embodiment of the invention;

Figure 5 is a block diagram of a microchip for use in association with a touch pad or carbon coated membrane activation/deactivation switch according to one embodiment of the invention;

Figure 6 is a schematic of a second type of device having a microchip controlled touch pad or carbon coated membrane activation/deactivation switch according to one embodiment of the invention;

Figure 7 is a schematic of a battery having embedded therein a microchip according to a further embodiment of the invention;

Figure 8A is a block diagram of a microchip for use in a battery according to one embodiment of the present invention;

Figure 8B is a block diagram of a second type of microchip for use in a battery according to another embodiment of the present invention;

Figure 9 is a schematic of a device having a microchip controlled switch according to one embodiment of the invention;

Figure 10 is a schematic of a device having a microchip controlled switch according to one embodiment of the invention;

Figure 11 is a schematic of a device having a microchip controlled switch according to one embodiment of the present invention;

Figure 12 is a schematic of a flashlight having therein a microchip controlled switch according to one embodiment of the present invention;

Figure 13 illustrates a possible position, according to one embodiment of the present invention of a microchip in a battery;

Figure 14 is a schematic of one embodiment of the present invention of a low current switching device suitable for lighting systems in buildings;

Figure 15 is a block diagram of one embodiment of the present invention, *i.e.* microchip 1403 of Figure 14;

Figure 16 is a flow diagram for a microchip as shown in Figures 4 and 5 for a delayed shut off function embodiment of one embodiment of the present invention; and

Figure 17 is a flow diagram for a microchip as shown in Figures 7 and 8a for a delayed shut off function embodiment of one embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

According to one embodiment or aspect of the present invention, and referring to Figure 1, a schematic depiction of main circuit 100 of an electronic device, for example, a flashlight, is provided, wherein the device has a microchip 103 and a microchip controlled input activator/deactivator 102, for example, a push button or sliding switch. Main circuit 100 of the device is powered by a current supplied by power source 101. Power source 101 may be any power source, *e.g.* a DC battery, as is well known to those of ordinary skill in the art. While the following discussion is

limited to specific electronic devices, that is flashlights, it is to be understood that the following description is equally applicable to other electronic devices including portable radios, toys, for example but not limited to battery operated cars, boats, planes, and/or other electrically powered toys.

Referring to Figure 1, when an operator activates input push button or sliding command switch 102 to the "on" position, the microchip 103 receives a signal. Switch 102 is a direct electrical input to microchip 103. Microchip 103 is grounded by grounding means 104. Microchip 103 is in series between power source 101 and load 105. Microchip 103 also transfers sufficient power through means of a current switch (not shown in Figure 1) to load 105 which can be, for example, a resistor-type bulb in the case of a flashlight to provide illumination.

The microchip 103, and other microchips of the present invention, can have its/their intelligence embedded in combinational or sequential logic, a PLA or ROM type structure feeding into a state machine or a true microcontroller type structure. The memory for the above will normally be non-volatile, but should there be a need for selectable options, EE or flash memory structures may be used.

The structure and operational parameters of such a microchip 103 are explained in greater detail below with respect to Figure 2. As shown in Figure 1, power is supplied to microchip 103 by power source 101. When an operator activates input switch 102 to the "on" position it represents a command which is communicated to microchip 103. Input means 102 requires very low current in preferred embodiments. In one embodiment of the invention, microchip control/reset means 201 simply allows the current switch 202 to pass current provided from power source 101 to load 105 in an unimpeded manner when the MMI switch 102 is activated, and, in the case of a flashlight, illumination is obtained. It is important to recognize, however, that it is control circuit 201 which activates current switch 202 upon acting on an input from MMI switch 102. Unlike heretofore known prior art devices, activating switch 102 does not conduct current to load 105, but is only a command input mechanism which can, according to the invention, operate on very low current. For example, according to the invention, touch sensor input or carbon coated membrane type switch devices are preferred.

If, for example, an emergency notification function is desired, the flashlight may be designed to alternately flash on and off every second. First, the operator activates input 102 into the appropriate position to indicate such a function is desired. During the "on" segment of the flashing routine, control/reset means 201 commands current switch 202 to close and let current flow through to load 105, thereby causing, in the case of a flashlight, the bulb to illuminate. Simultaneously, control/reset means 201 uses the timing means 203 as a clock for timing. After control/reset means 201 determines one second has elapsed, control/reset means 201 instructs current switch 202 to open and interrupt the current flow through to load 105, and bulb illumination is discontinued. It is important to note that both control/reset means 201 and current switch 202 are still active and fully powered; however, current delivery is now latent with respect to load 105. When another second has elapsed, a command is passed from control/reset means 201 which again allows current to be delivered through current switch 202 to load 105, and in the case of a flashlight, bulb illumination is immediately resumed. The device continues an alternating current delivery routine until either the operator switches the setting of the activating input switch 102 to the "off" position, or until the conditions pre-programmed into the microchip, *e.g.* into the control/reset means 201, are satisfied and current delivery is permanently discontinued.

Similar operating routines can be employed to generate other conspicuous flashing functions such as the generation of the universal distress signal S.O.S. in Morse code. Again, such a function would require that the microchip, *e.g.* control/reset means 201, be pre-programmed with the appropriate code for creating such a signal, and to permit current transmission from switch 202 to load 105 in accordance with the code with the assistance of timing means 203. For example, it may be desirable to have an S.O.S. sequence wherein flashes representing each individual letter are separated by time intervals ranging from one-half (1/2) second to one (1) full second, while the interval between each letter in the code comprises two (2) full seconds. After a certain number of repetitions of the routine, again determined by the operator or as pre-programmed within the microchip, *e.g.* within the control/reset means 201, the signal is discontinued.

As shown in Figure 3, it is possible to remove grounding means 104 from main circuit 100. However, it is then necessary to intermittently provide an alternative power

source for microchip 103 and to create a virtual ground reference level. A suitable microchip 103 for this configuration is described in greater detail below with respect to Figures 8A and 8B.

Referring now to Figure 4, utilizing the circuits in the microchip of some embodiments of the present invention, carbon coated membrane or touch pad type switches are preferred. Carbon coated membrane switches and touch pad switches have many advantages over conventional high current switches, such as those currently used in flashlights. According to the present invention, carbon coated membrane type switches, low current type switches, and touch pad type switches can be used which may be smaller, less costly, easier to seal, and less vulnerable to corrosion and oxidation than conventional switches which also transfer energy or current to the load. Moreover, according to one embodiment of the present invention, carbon coated membrane type switches, touch pad switches, or low current type switches can be formed structurally integral with the product, for example, with the casing of a flashlight.

A block diagram showing microchip 103 for use, in accordance with one embodiment of the present invention, in association with a carbon coated membrane, a touch pad switch, or a low current type switch 106 is now explained in greater detail in respect to Figure 5. According to this one embodiment of the present invention, current switch 202 is powered directly by grounded power source 101. However, output of current from current switch 202 to load 105 is dependent on control/reset means 201. When an operator depresses touch pad 106, carbon coated membrane switch 106 or low current type switch 106, control/reset means 201 allows current switch 202 to flow current through to load 105. However, in more intelligent applications according to certain embodiments of the present invention, control/reset means 201 will coordinate, based on clock and/or timing means 203, to execute timing routines similar to those described above such as, but not limited to, intermittent flashing, the flashing of a conspicuous pattern such as Morse code, dimming functions, battery maintenance, battery strength/level, etc.

Figure 16 is a flow diagram for a microchip 103 as shown in Figures 4 and 5 and provides a delayed shutoff function. The flow sequence commences at START when the power source 101 is connected to the microchip 103, as shown in Figure 4. The

sequence of operation is substantially self-explanatory and is not further elaborated herein.

As shown in Figure 6, grounding means 104 can be removed from the system as a matter of design choice. A more detailed description of a suitable microchip 103 for this type of configuration is provided below with respect to Figures 8A and 8B.

Referring to Figure 7, certain embodiments of the present invention also provide for a battery having a microchip embedded for use in association with an electronic device. As shown, direct current is provided to microchip 103 by power source 101. When activating input switch 102 is closed, current is complete and power is transferred to load 105 at the direction of microchip 103. Microchip 103 embedded in the battery can have any number of intelligent functions pre-programmed therein, such as, for example but not limited to, battery strength monitoring, recharging, adjustment of average current through a current switch, intermittent power delivery sequences, and so on. Examples of suitable microchips 103 for this type of application are discussed below with reference to Figures 8A and 8B.

Figures 8A and 8B are block diagrams of two different further embodiments of the present invention. Microchip 803 is especially suitable for applications wherein microchip 803 is not grounded through the body of the electrical device or where a ground cannot otherwise be established because of design considerations. This embodiment is useful to provide sufficient operating power to the microchip and can be achieved by periodically opening and closing current switch 202 when activation input switch 102 is closed. For example, referring to Figure 8A, when input switch 102 is closed but current switch 202 does not conduct (that is, the switch is open and does not allow current to flow to load 105), then voltage drop over load 105 is zero and in the case of a flashlight, no illumination is provided from the bulb. Instead, the full voltage drop is over current switch 202 and in parallel with the diode 204 and capacitor 205. Once capacitor 205 becomes fully charged, current switch 202 can close and circuit 103 will be powered by capacitor 205. When circuit 803 is adequately powered, it functions in a manner identical to the circuits described previously with respect to the functions provided by control/reset means 201 and timing means 203.

When the charging capacitor 205 starts to become depleted, control/reset means 201 will recognize this state and reopen the current switch 203, thus briefly prohibiting the flow of current to load 105, in order to remove the voltage drop from load 105 and allow capacitor 205 to recharge and begin a new cycle. In a flashlight application, the time period wherein current flow from current switch 202 is discontinued can be such that the dead period of the light is not easily or not at all detectable by the human eye. In the case of a high current usage load, such as a flashlight, it means the ratio of the capacitance of the capacitor having to power the microchip and the current consumption of the microchip, must be such that the capacitor can power the microchip for a long time relative to the charging time (202 open). This will enable the flashlight's "off" time to be short and the "on" time to be long, thus not creating a detectable or intrusive switching of the flashlight to the user.

Figure 17 is a flow diagram for a microchip as shown in Figures 7 and 8 which also provides a delayed shutoff function. The flow diagram is substantially self-explanatory and the flow sequence commences at START when closure of the switch 102 takes place from an open position.

According to another embodiment of the present invention, *e.g.* in relation to another product of low current consumption, such as a FM radio, the designer may opt for a capacitive (reservoir) device externally to the microchip (see FIG. 11). In this case, the electrical device may function for a time longer than the time required for charging the capacitor (205, 207) which is when the current switch (202) is open and not conducting current.

According to another embodiment of the present invention, an output may be provided to indicate a condition, *e.g.* a battery is in good or bad condition. It may also be suitable to assist in locating a device, *e.g.* but not limited to a flashlight, in the dark. This may be a separate output pin or may be, according to another embodiment, shared with the MMI switch input. (See FIG. 11) This output or indicator may be a LED. Referring to Figure 11, indicator/output device 1104 may, for example, be an LED. When microchip 1113 pulls the line 1114 to high, the LED 1104 shines. LED 1104 may also shine when switch 1111 is closed by the user. However, since that is only a momentary closure, this should not create a problem.

According to a further specific embodiment of the invention, referring to Figure 11, microchip 1113 can activate the LED 1104 for a short time, *e.g.* every 100 milliseconds, every 10 seconds. This indication will let potential users know the device is in a good state of functionality and will enable fast location of the device in the dark, *e.g.* in times of emergency. The low duty cycle will also prevent unnecessary battery depletion. With an alternative embodiment of the present invention, Figure 8B illustrates the charging and discharging of capacitor 207 to provide power to circuit 803, wherein the diode and capacitor structure establishes a ground reference for circuit 803.

Each of the embodiments explained with respect to Figures 8A and 8B are suitable for use, according to the present invention, depending upon the application. Indeed, the embodiments shown in Figures 8A and 8B can be directly embedded into a battery and/or can be separately constructed in another portable structure, *e.g.* but not limited to, in the shape of a disc, about the size of a quarter, to be inserted at the end of the battery between the output means or positive terminal of the battery and the current receiving structure of the electronic device. As described, the embodiments shown in Figures 8A and 8B can be utilized with the prior art high current switches currently being utilized in simple non-intelligent electronic devices, for example flashlights, radios and toys. For example, in the case of a portable simple radio without any intelligence, an automatic shut "off" may be achieved by using the intelligent battery or portable microchip of the present invention having a timing function to automatically shut off the radio after a given period of time, *i.e.* after the user is asleep.

The architecture of the two embodiments of the present invention shown in Figures 8A and 8B provide certain advantages over the simple dumb architecture in current simple electrical devices, for example, flashlights. Due to the unique design of the microchips, as shown in Figures 8A and 8B, after the device (into which the microchip is incorporated) is shut off the microchip remains powered for an additional period of time which allows for said microchip to thus receive additional commands, for example, a second "on" activation within a given period after a first "on" and "off" activation, may be programmed into the microchip (control/reset means) to indicate a power reduction or dimming function or any other function as desired by the designer

of said device. This is accomplished by the inventive designs of the present invention without having to utilize substantial energy from what are typically small exhaustible power sources, *e.g.* DC batteries in the case of flashlights.

According to some embodiments of the present invention, more intelligent devices include many other useful functions pre-programmed within the microchip, *e.g.* in control/reset means 201 and may, *e.g.* be assisted by a timing means 203. Referring to Figure 2, commands can be entered through switch 102 in several different ways. First, various time sequences of closed and open activations may represent different commands. For example, but not limited to, a single closure may instruct microchip 103 to activate current switch 202 continuously for a pre-determined length of time. Alternatively, two successive closures may instruct the microchip 103 to intermittently activate current switch 202 for a pre-determined length of time and sequence, for example, a S.O.S. sequence.

Secondly, referring to Figure 9, commands may be communicated to microchip 903 through the use of various voltages recognizable by microchip 903 to represent various commands. For example, but not limited to, according to one embodiment of the present invention, it may include multiple activating switches 901 and 902 connecting different voltages to the command input structure of microchip 903.

Thirdly, referring to Figure 10, commands may be communicated to microchip 1003 through the use of multiple specific switches (1004, 1005, 1006, 1007) which when activated either singularly or in combination is/are recognizable by microchip 1003 as representing various different commands.

As can be seen by Figure 9, switch 901 and 902 and in Figure 10, switches 1004, 1005, 1006, and 1007, power or ground may be used as a command reference voltage level. For example, the switches in Figure 10 may be connected to another ground instead of point 1008 depending on the internal structure of the microchip.

The control/reset means included in the inventive microchips of the present invention may and in some instances, depending upon the application, should in addition to the many possible user functions described above, include means for adjusting the average current over a switch and/or a means for providing a gradual "on"/"off" current flow, so that the operator does not appreciably perceive the increase and decrease in

light provided by the device. These features allow for an ongoing variable level of lighting as desired by an operator, and may also lengthen the life span of the activation switch, the bulb, and the power source. Moreover, several functions can now be added to an existing device, like a flashlight, through the use of a battery having embedded therein a microchip according to the present invention.

In another embodiment of the invention, the microchip is adapted to control lighting in buildings. The normal switch on the wall that currently functions as both a power-switch and MMI can be replaced by a low current switching device like a membrane switch, touch pad or carbon coated switching device. Since very low currents are required by the MMI switch (device) that replaces the normal wall mounted (A/C) switch, it is possible to replace the normal high voltage/current (dangerous) wiring to the switch and from the switch to the lead (light), with connectivity means suitable to the new low current DC requirements. As such, in the case of normal A/C wiring (110V/220V), the dangerous wiring can now be restricted to the roof or ceiling and all switches (MMI's) can inherently be safe. This may make the expensive and regulated safety piping required for the wiring of electricity to wall switches redundant.

In a specific embodiment, the traditional wiring between the light and the wall switch is replaced by flexible current conducting tape that can be taped from the roof and down the wall to the required location. In another embodiment, the connections can be made by current conducting paint or similar substances. In both cases above, it can be painted over with normal paint to conceal it. This makes changing the location of a wall switch or the addition of another switch very easy.

The microchip according to the present invention can be located in the power fitting of the light. The microchip having the low current (MMI) input and a power switch to block or transfer the energy to the load (light, fan, air conditioner). It reacts to the inputs received to activate or disable, or control other functions, of whatever device it is controlling.

The microchip may be adapted to contain the high current/voltage switch or control an external switching device or relay. The microchip may also, as in the other embodiments discussed, have some intelligence to control functions like dimming, delayed shut off, timed activation/deactivation, timed cycles, flashing sequences and

gradual on/off switching. The microchip may also be adopted, as in a specific flashlight embodiment discussed, to provide a location/emergency signal for lighting/flashing an LED.

Figure 12 shows a flashlight 1200 with a housing 1202, batteries 1204, a bulb 1206, a reflector and lens 1208, a switch 1210 and a microchip 1212. The flashlight has a conventional appearance but its operation is based on the microchip 1212 controlling the operation of the switch 1210, as described hereinbefore.

Figure 13 illustrates that a battery 1300 with positive and negative terminals 1302 and 1304 respectively, and of substantially conventional shape and size, can be fabricated with an integral microchip 1306, of the type described hereinbefore. Alternatively the microchip can be mounted to the battery, for example by being inserted into a preformed cavity. As the microchip is inserted into the cavity it makes contact with the positive and negative terminals on the battery. The microchip also carries external terminals so that when the battery is inserted into an appliance (not shown) it makes direct contact with corresponding terminals on the appliance so that the microchip is automatically connected in circuit.

The power input 101 in Figure 14 may be DC (eg 12V) as is commonly used for some lights or A/C (110V or 240V). The device shown as 1403 may be monolithic or be a multichip unit having a relay (solid state or mechanical), a regulator (eg: 110AC volt to 12V DC) and a microchip as discussed in this application.

In a specific embodiment, Ic pin 1406 can normally be high and a closure of input means 1402, *e.g.* any of the low current switching devices described above, can be detected as Ic pin 1405 also goes too high. To flash the LED 1404 the microchip will reverse the polarities so that Ic pin 1405 becomes high with regards to Ic pin 1406. During this time, it may not be possible to monitor the closure of the input 1402 switch and the LED 1404 may not shine should the input 1402 be closed. In another embodiment, microchip 1403 is able to detect closure of input 1402 before reversing the voltage polarity as discussed and if it detects closure, it does not proceed with reversing the polarity.

Reference 1407 denotes an MMI wall unit, and reference 1408 denotes a high voltage roof unit.

In Figure 15, microchip 1503 does not contain a current switch (eg switch 102) as shown in Figure 2. However, if desired a regulator 1504 and relay 1505 can be integrated into a single monolithic microchip 1503. In case of a 12V (DC) local voltage this may be done in any event unless the current/power considerations are too high to make it practical.

In another embodiment, the microchips 1403 and 1503 are adapted to receive commands not only via the MMI input but also over the load power (electricity) wiring. This would allow a central controller to send out various commands to various power points, controlled by a microchip according to this invention, by using address information of specific microchips or using global (to all) commands.

Referring again to Figure 1, and this is being done purely for the sake of example, the microchip 103 is activated by sliding or activating a switch 102. It is apparent that different switches can be provided for different functions of the microchip. However, in order to enhance the user-friendliness of the device, a single switch may be capable of controlling different functions of an appliance such as a flashlight to which the microchip is mounted.

Assume for the sake of example that the switch 102 is used to turn the microchip on in the sense that a flashlight is turned on. A switch 110 may then be used at any time to turn the flashlight off, by appropriately controlling operation of the microchip. This is a conventional approach to controlling the operation of the microchip. As an alternative the operation of the switch 102 can be sensed by means of a timing device 112. The timing device is started when the switch 102 is closed and after a short time period, say of the order of 5 seconds or less, which is measured by the timing device, the mode or function of the switch 102 changes so that, upon further actuation of the switch 102, the switch duplicates the function of the switch 110 which can therefore be dispensed with. Thus, initially the switch 102 functions as an on-switch while, a short period after its actuation, the switch 102 functions as an off-switch. If follows that with minor modifications to the circuitry of the microchip a single switch can exhibit multi-mode capabilities with the different modes being distinguished from each other or being exhibited on a time basis or, if necessary, on any other basis.

Multimode capabilities can for example be incorporated in a microchip wherein the function of a switch is also linked to time. In this sense the word "function" means the action which ensues or results upon the detection of the closure of the switch. For example a single switch may, from an off state of a flashlight, enable (a) the switching on of the flashlight and (b) the selection of one of a number of various modes like dimming level, flashing rate/sequence etc when the switch is closed a number of times.

If however a certain time is allowed to pass (say five seconds) without any further closure of the switch taking place (indicating a mode has been selected), the function resulting from the next closure may be changed. Thus instead of selecting another mode, the closure may be interpreted as an "off" command.

In other words a sequence of switch closures within five seconds of each other will continue to step the microchip through a number of predefined modes. However should at any stage a time of more than five seconds elapse between consecutive presses or closures of the switch then the next switch operation will switch the flashlight off rather than stepping the microchip to another mode.

Clearly these characteristics are not confined to the use of the chip with a flashlight for the chip can be used with other applications to vary the mode of operation thereof in an analogous way. Thus, for the flashlight, the function of the switch will affect the operation of the flashlight in a manner which is dependent on the time period between successive actuations of the switch. More generally, in any electrical device which is controlled by means of the microchip the operation of the device will be regulated by the function which is exhibited by a switch which is in communication with the microchip. The switch function in turn is dependent on the duration of a time period between successive operations of the switch.

Other modes can also be exhibited by a single switch. For example, depending on requirement, a switch can be used for on and off operation, for initiating the transmis-

sion of an emergency signal, for initiating the gradual dimming of a flashlight or the like. The scope of the invention is not limited in this regard.

While the preferred embodiments of the present invention have been described in detail, it will be appreciated by those of ordinary skill in the art that changes and modifications may be made to said embodiments without, however, departing from the spirit and scope of the present invention as claimed.

CLAIMS

1. An intelligent flashlight having a power source, said flashlight including:

at least one non-energy transferring MMI signal switch and a microchip in communication with said switch,

the switch being capable of only transmitting a signal to said microchip that the switch has been activated or deactivated by a user, and

the microchip being in communication with the power source and controlling the on/off functions and at least one other function of the device in response to the receipt of activation and deactivation signals from the switch.

2. The intelligent flashlight of claim 1, wherein the switch is structurally integral with the microchip and adapted for single wire input operation.

3. The intelligent flashlight of claim 1 or 2, wherein the switch includes a carbon coated membrane interface.

4. The intelligent flashlight of claim 1 or 2, wherein the switch includes a touch pad interface.

5. The intelligent flashlight of any one of claims 1 to 4, wherein the microchip includes a control/reset means.

6. The intelligent flashlight of any one of claims 1 to 5, wherein the microchip includes a timing means.

7. The intelligent flashlight of any one of claims 1 to 6, wherein the at least one other function controlled by the microchip is a delayed shut off function.

8. The intelligent flashlight of any one of claims 1 to 7, wherein the at least one other function controlled by the microchip is an average current adjustment function.

9. The intelligent flashlight of any one of claims 1 to 8, wherein the at least one other function controlled by the microchip is a power reduction function.

10. The intelligent flashlight of any one of claims 1 to 9, wherein the at least one other function controlled by the microchip is an oscillating power function.

11. The intelligent flashlight of any one of claims 1 to 10, wherein the at least one other function controlled by the microchip is an intermittent code sequence function.

12. The intelligent flashlight of any one of claims 1 to 11, wherein the at least one other function controlled by the microchip is a determination of the charge remaining in the power source function.

13. The intelligent flashlight of claim 12, wherein the microchip is in communication with a means for indicating to an operator the charge remaining in the power source.

14. The intelligent flashlight of any one of claims 1 to 12, wherein the microchip recognizes that a number of successive activations/deactivations signals received from the signal switch corresponds to a particular specific at least one other function.

15. The intelligent flashlight of any one of claims 1 to 14, wherein the microchip recognizes that the receipt of different voltages from the signal switch corresponds to different command functions.

16. The intelligent flashlight of any one of claims 1 to 15, wherein said switch includes more than one switch with each switch indicating a different command function recognizable by the microchip.

17. The intelligent flashlight of any one of claims 1 to 15 wherein the switch is a multi-mode switch which, in each mode, controls a different function.

18. The intelligent flashlight of any one of claims 1 to 5, 13 to 17, wherein the at least one other function controlled by the microchip is selected from the group consisting of delayed shut off, oscillating power, dimming, intermittent code sequence, average current adjustment, and battery remaining charge functions.

19. The intelligent flashlight of any one of claims 1 to 18 wherein the function of the switch is dependent on the time period between successive actuations of the switch.

20. An intelligent battery for use with an electrical device, the battery having positive and negative terminal ends and including:

> a microchip embedded in the battery for controlling an on/off function and at least one other function of an electrical device.

21. The intelligent battery of claim 20, wherein the microchip includes a control/reset means.

22. The intelligent battery of claim 20 or 21, wherein the microchip includes a timing means.

23. The intelligent battery of claim 20, 21 or 22, wherein the at least one other function controlled by the microchip is a delayed shut off function.

24. The intelligent battery of any one of claims 20 to 23, wherein the at least one other function controlled by the microchip is an average current passed from the battery adjustment function.

25. The intelligent battery of any one of claims 20 to 24, wherein the at least one other function controlled by the microchip is a power reduction function.

26. The intelligent battery of any one of claims 20 to 25, wherein the at least one other function controlled by the microchip is an oscillating power function.

27. The intelligent battery of any one of claims 20 to 26, wherein the at least one other function controlled by the microchip is an intermittent code sequence function.

28. The intelligent battery of any one of claims 20 to 27, wherein the at least one other function controlled by the microchip is a determination of the charge remaining in the battery function.

29. The intelligent battery of claim 28, wherein the microchip is in communication with a means for indicating to an operator the amount of charge remaining in the battery.

30. The intelligent battery of any one of claims 20 to 29 wherein the at least one other function is dependent on the time period which elapses between successive actuations of the said on/off function.

31. A portable microchip device for use with a power source and an electrical device powered by said source, said electrical device having an input means for activating and deactivating said power source, said microchip including:

means for controlling an on/off function and at least one other function of the device upon receipt of a signal from said input means upon activation and deactivation of said input means.

32. The microchip device of claim 31, wherein the at least one other function is a power reduction function.

33. The microchip device of claim 31 or 32, wherein the at least one other function is an oscillating power function.

34. The microchip device of any one of claims 31 to 33, wherein the at least one other function is a delayed power off function.

35. The microchip device of any one of claims 31 to 34, wherein the at least one other function is a power adjusting function.

36. The microchip device of any one of claims 31 to 35, wherein the at least one other function is an intermittent power function.

37. The microchip device of any one of claims 31 to 36, wherein the microchip device is disc-shaped.

38. The microchip device of claim 31, wherein the at least one other function is selected from the group consisting of delayed power off, oscillating power, average current adjustment, intermittent power, dimming, and power source energy remaining functions.

39. The microchip device of any one of claims 31 to 38 wherein the said input means is a multi-mode device which, in each mode, controls a different function.

40. The microchip device of any one of claims 31 to 39 wherein the function of said input means is dependent on the duration of a time period between successive operations of said input means.

41. An intelligent portable electrical device including:

a non-energy transferring MMI signal switch,

a microchip, and

a switch, the switch being in communication with the microchip and capable of transmitting a signal to the microchip that the switch has been activated or deactivated, wherein the microchip controls an on/off function and at least one other function of the device in response to the activation and deactivation signals received from the switch.

42. The electrical device of claim 41, wherein the other function is selected from the group consisting of delay power off, oscillating power, dimming, intermittent code sequence, average current adjustment, and battery remaining charge functions.

43. The device of claim 41 or 42 wherein the function of said switch is dependent on the duration of a time period between successive operations of said switch.

44. A battery including:

an energy storage section, a processor, and first and second terminal ends,

wherein the first terminal end is connected to said energy storage section,

the second terminal end is connected to the processor, and

the processor controls the connection of the second terminal end to the energy storage section.

45. An electrical device including:

a power supply, an activating/deactivating means, and a processor,

wherein the processor controls at least one function of the device in response to a signal received from the activating/deactivating means.

46. A flashlight including:

a light source, an energy storage means in communication with the light source, a switch means, and a processor means wherein said processor means controls the activation of the light source in response to signals received from the switch means.

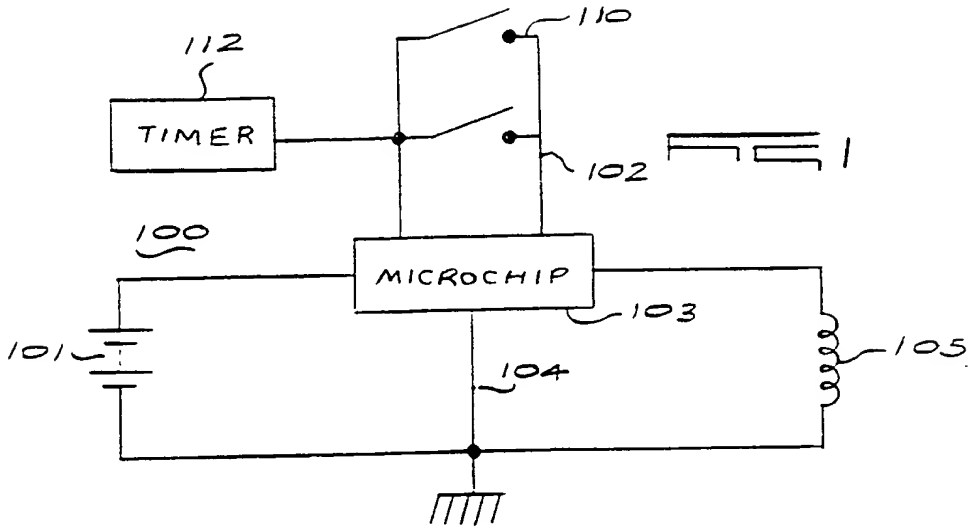


FIG 1

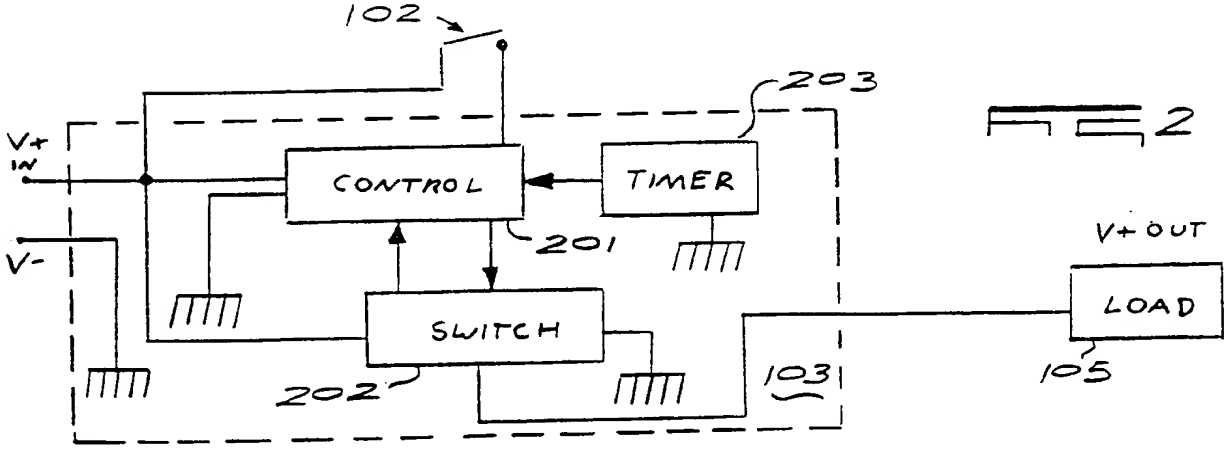


FIG 2

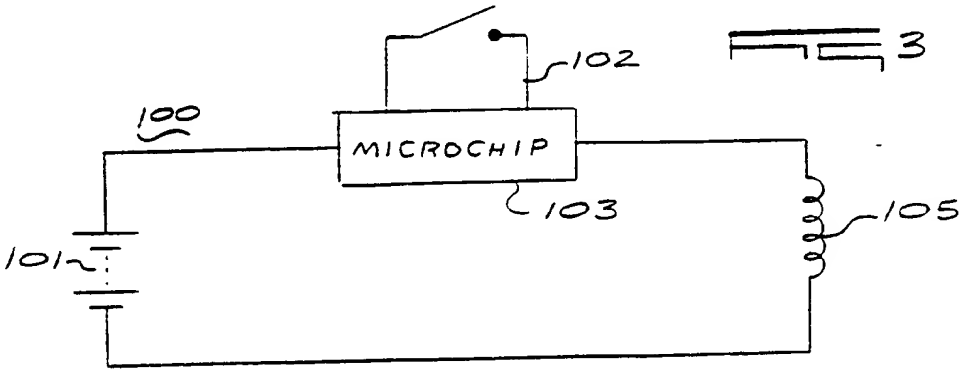


FIG 3

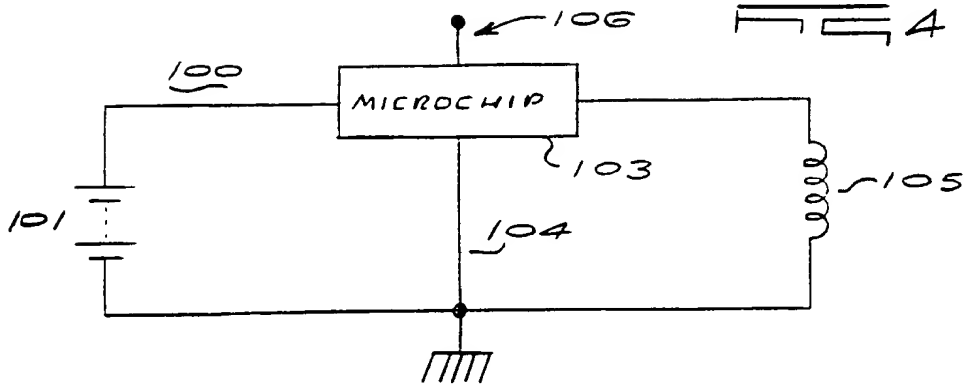
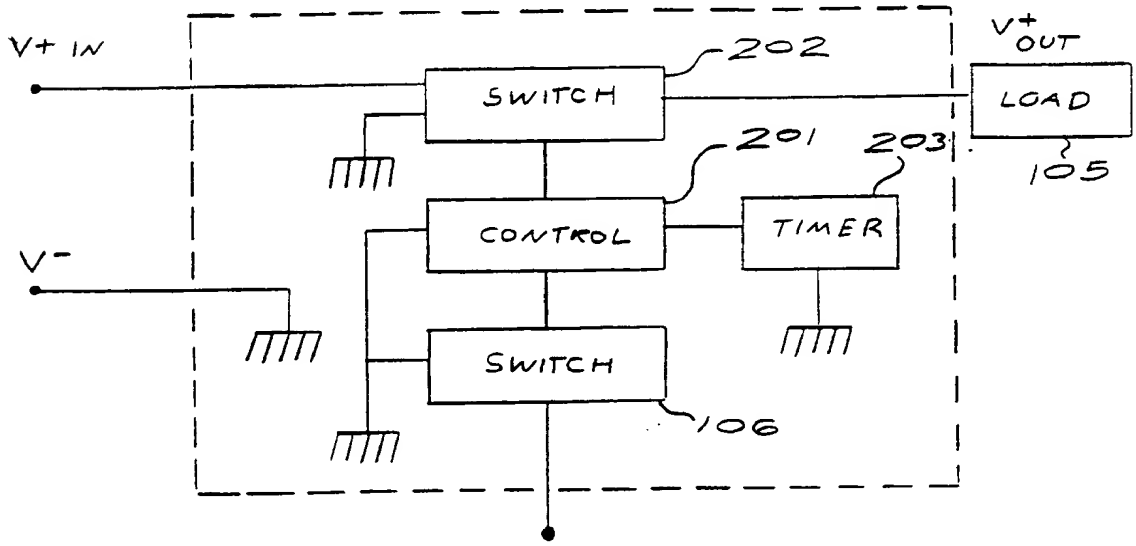


FIG 4

FIG 5



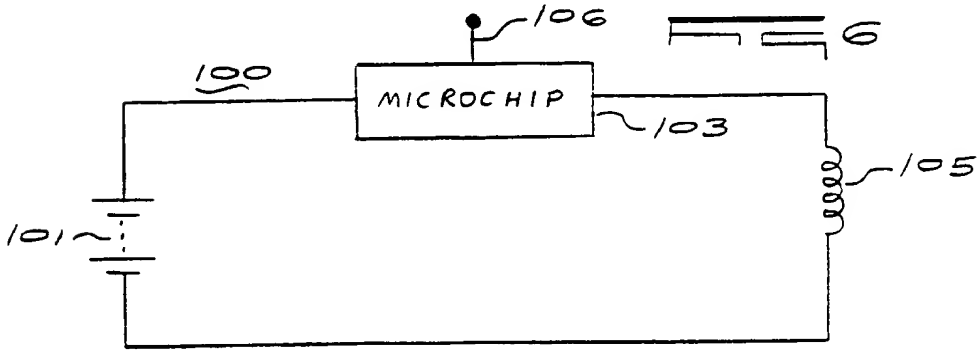


FIG 6

FIG 7

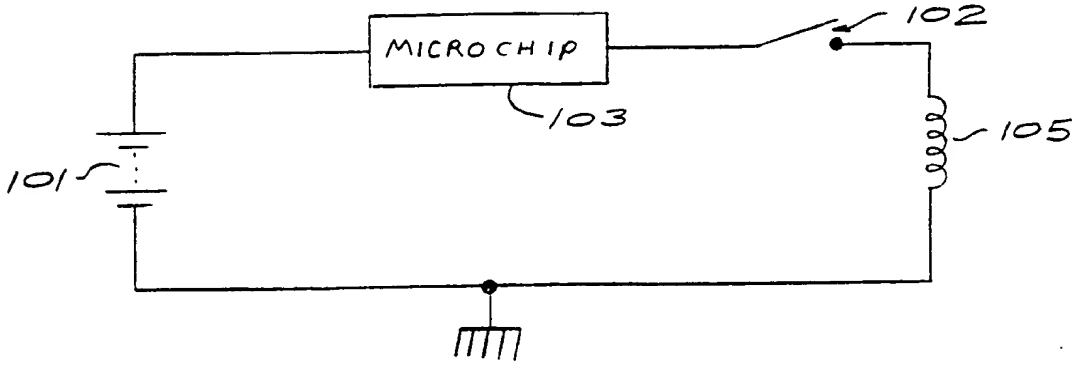


FIG 8A

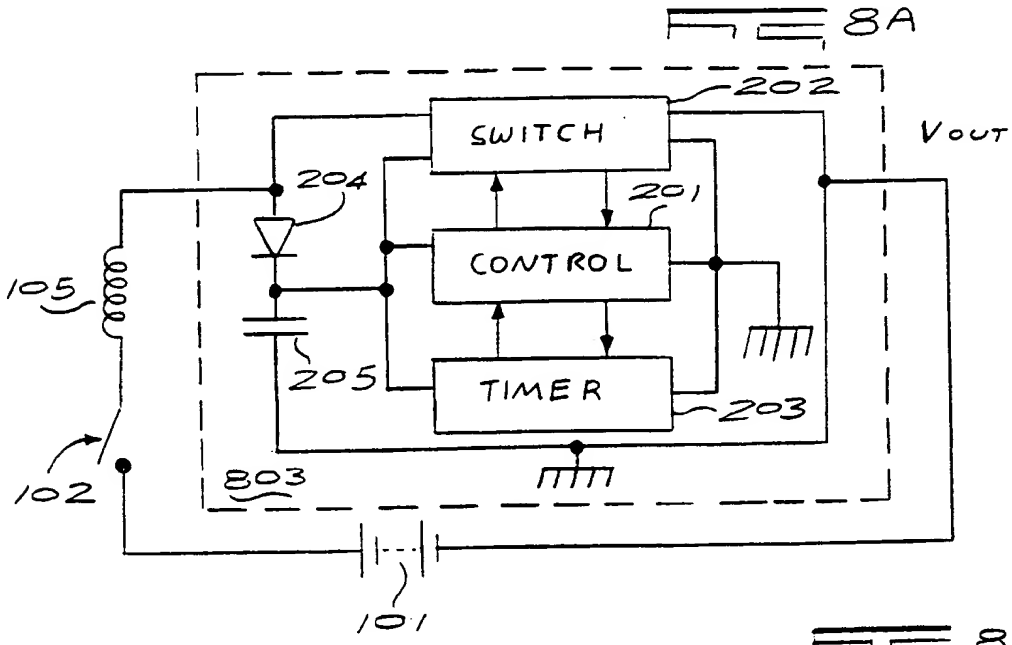


FIG 8B

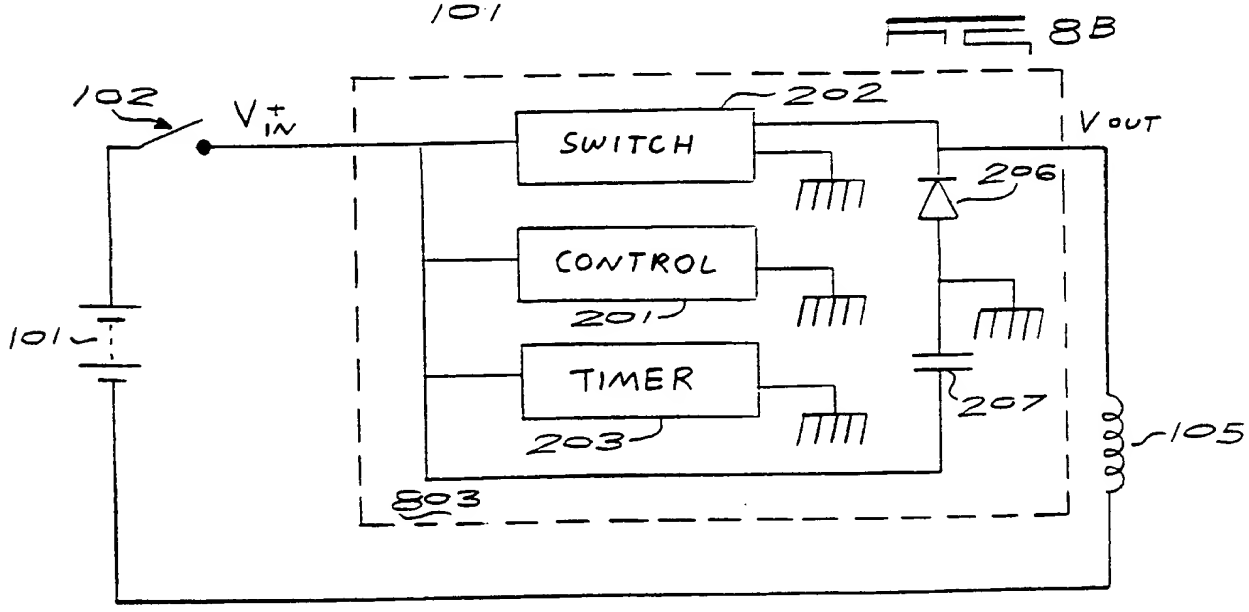
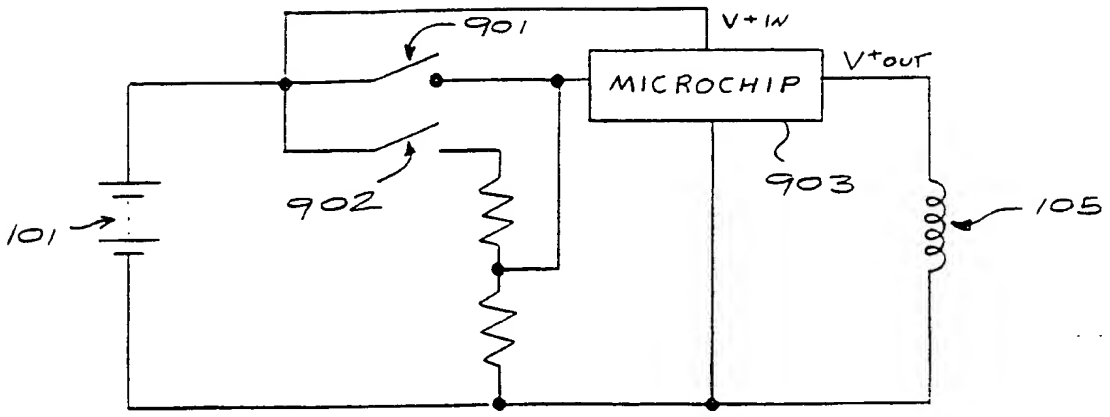


FIG 9



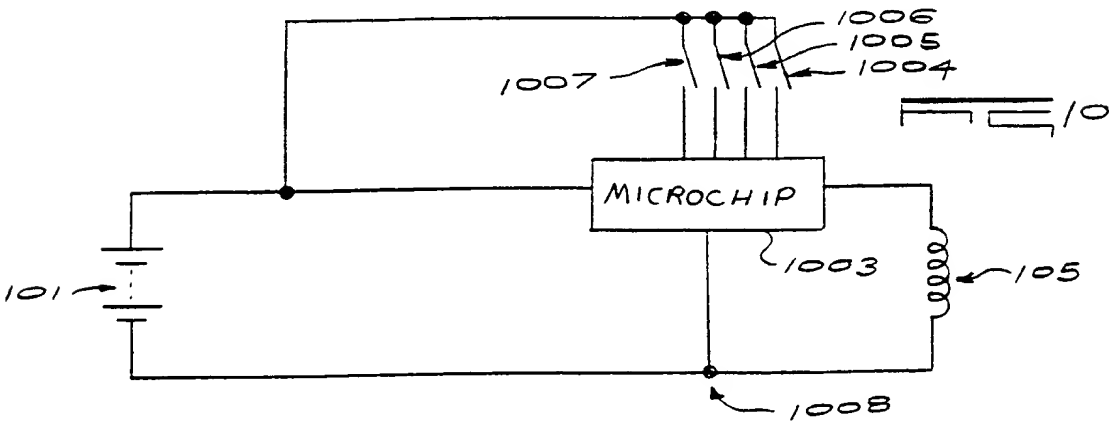


FIG 10

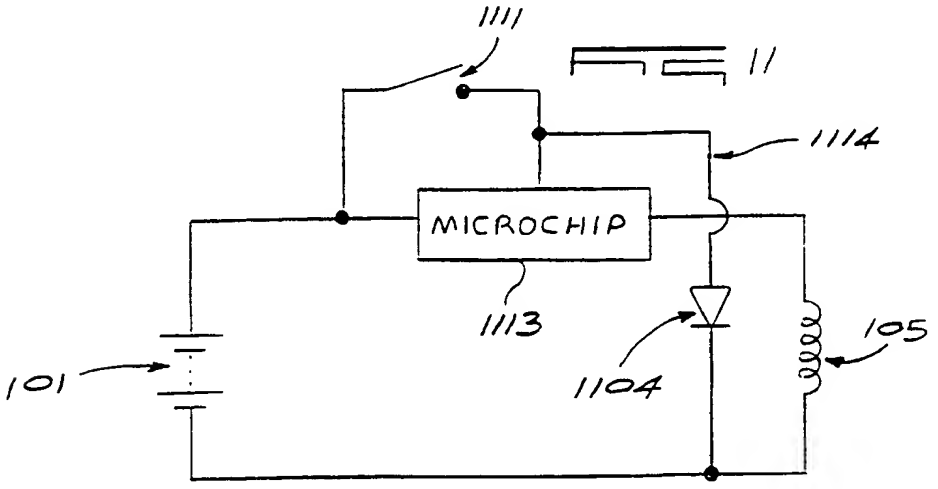


FIG 11

FIG 12

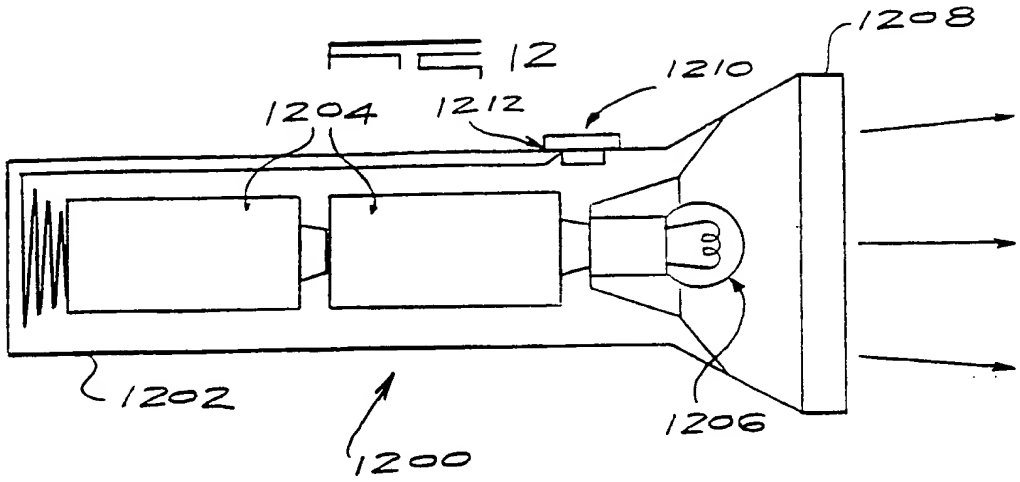


FIG 13

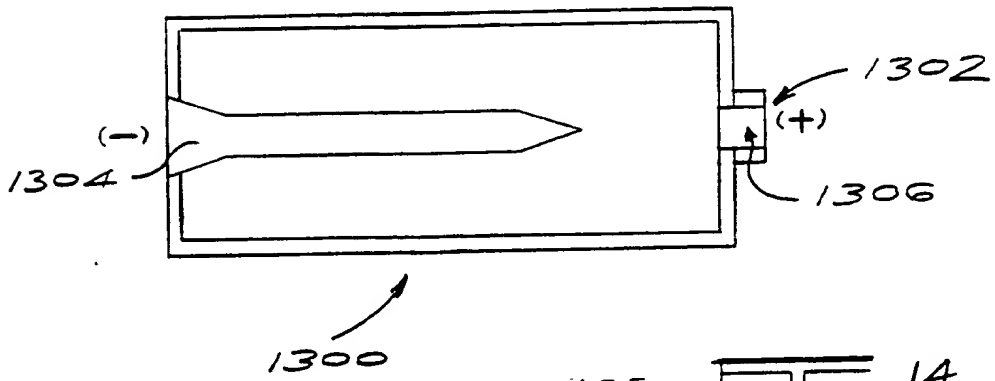


FIG 14

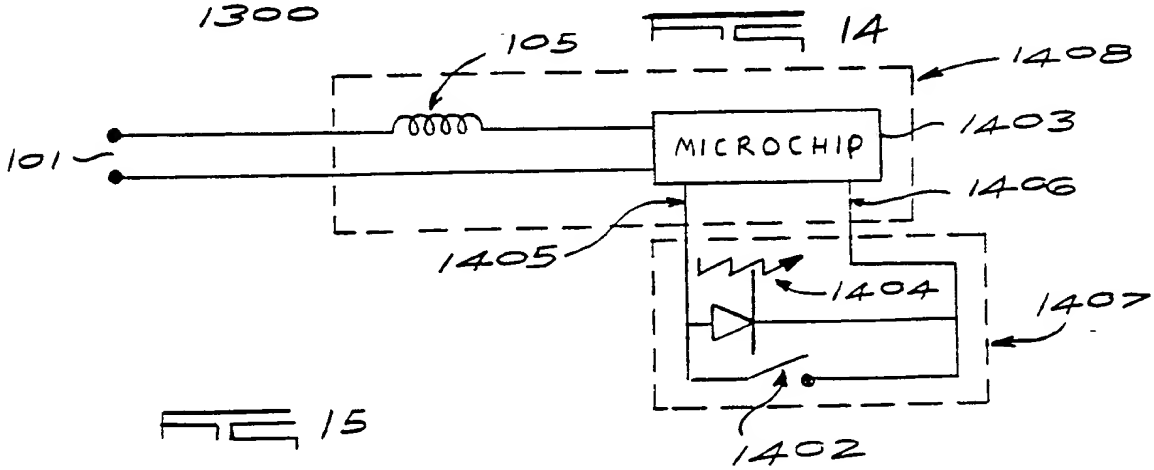
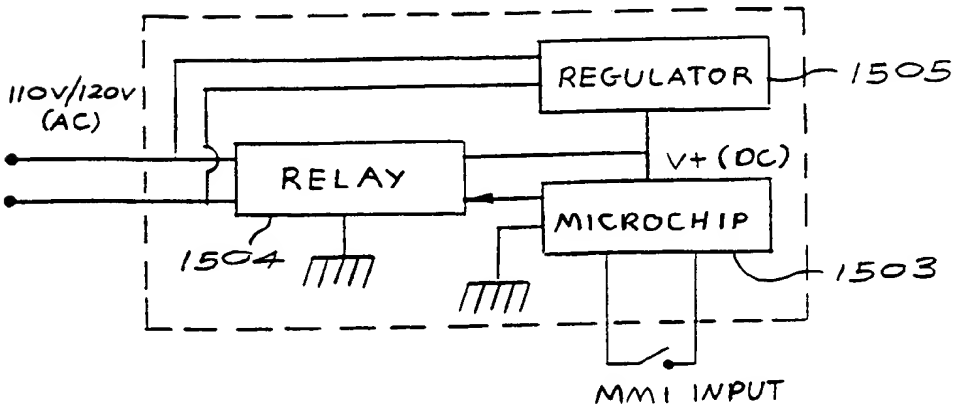


FIG 15



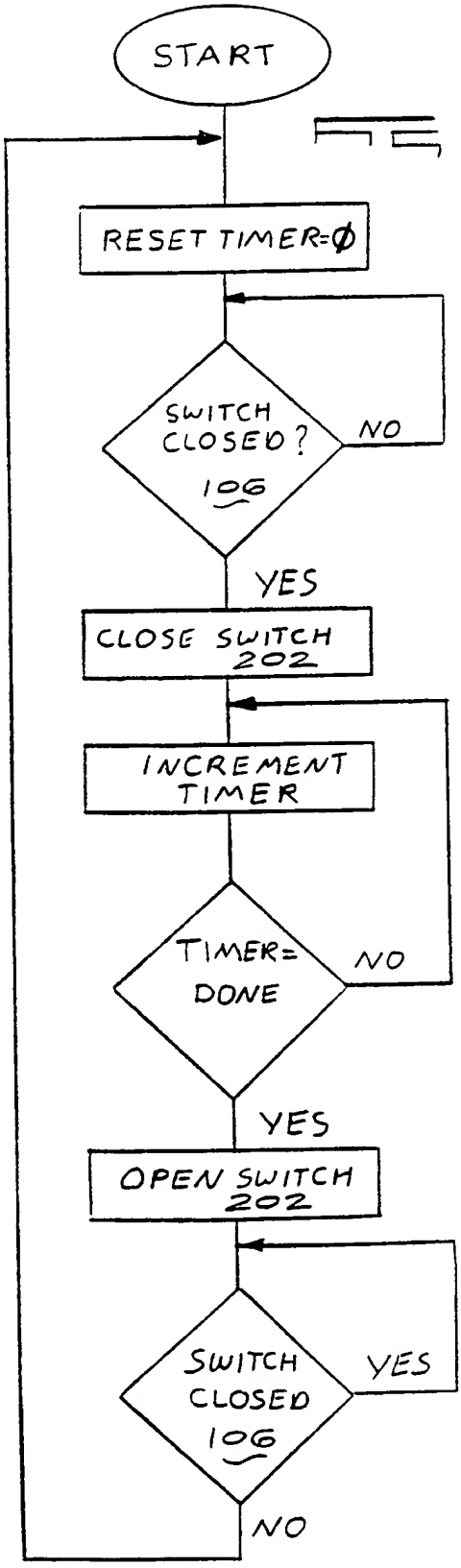

START
RESET TIMER=Ø
SWITCH CLOSED? 106
NO
YES
CLOSE SWITCH 202
INCREMENT TIMER
TIMER= DONE
NO
YES
OPEN SWITCH 202
SWITCH CLOSED 106
YES
NO

FIG 16

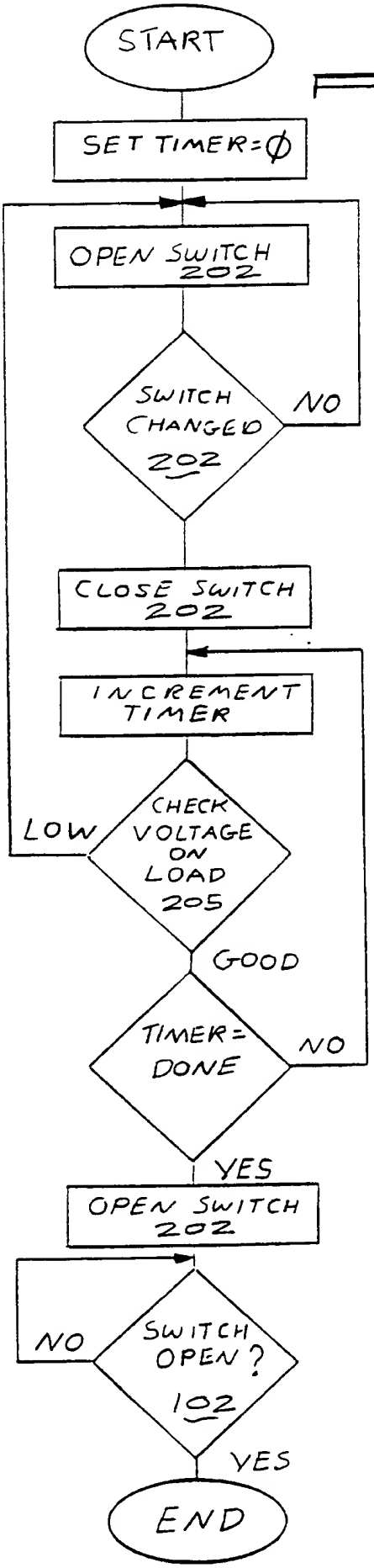

START
SET TIMER=Ø
OPEN SWITCH 202
SWITCH CHANGED 202
NO
CLOSE SWITCH 202
INCREMENT TIMER
CHECK VOLTAGE ON LOAD 205
LOW
GOOD
TIMER= DONE
NO
YES
OPEN SWITCH 202
NO
SWITCH OPEN? 102
YES
END

FIG 17

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Articl 18 and Rul s 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION**	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
P.18703/MAJR		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/ZA 99/00107	08/10/1999	09/10/1998
Applicant		
BRUWER, Frederick, Johannes		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 5 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

   a. With regard to the **language,** the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

   [ ] the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

   b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

   [ ] contained in the international application in written form.

   [ ] filed together with the international application in computer readable form.

   [ ] furnished subsequently to this Authority in written form.

   [ ] furnished subsequently to this Authority in computer readble form.

   [ ] the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   [ ] the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. [ ] **Certain claims were found unsearchable** (See Box I).

3. [X] **Unity of invention is lacking** (see Box II).

4. With regard to the **title,**

   [ ] the text is approved as submitted by the applicant.

   [X] the text has been established by this Authority to read as follows:

   INTELLIGENT FLASHING

5. With regard to the **abstract,**

   [X] the text is approved as submitted by the applicant.

   [ ] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No. 2

   [X] as suggested by the applicant.

   [ ] because the applicant failed to suggest a figure.

   [ ] because this figure better characterizes the invention.

   [ ] None of the figures.

PCT WORLD INTELLECTUAL PROPERTY ORGANIZA
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : **H05B 37/00, 41/30, 41/32, G08B 21/00, H01M 10/48**	**A3**	**(11) International Publicati n Number:** **WO 00/22890** **(43) International Publicati n Date:** 20 April 2000 (20.04.00)

(21) International Application Number: PCT/ZA99/00107

(22) International Filing Date: 8 October 1999 (08.10.99)

(30) Pri rity Data:
09/169,395 9 October 1998 (09.10.98) US

(71)(72) Applicant and Inventor: BRUWER, Frederick, Johannes [ZA/ZA]; Unit 2, Lifestyle Management Park, 0157 Lyttelton (ZA).

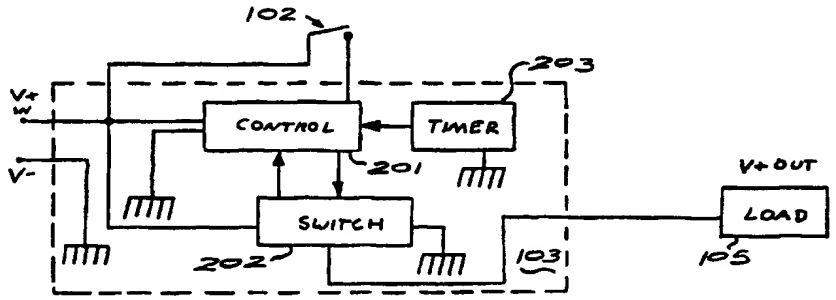
(74) Agent: McCALLUM RADEMEYER & FREIMOND; P.O. Box 1130, 2125 Randburg (ZA).

(81) Designated States: AE, AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, EE (Utility model), ES, FI, FI (Utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(88) Date of publication of the international search report:
26 October 2000 (26.10.00)

(54) Title: INTELLIGENT FLASHING



(57) Abstract

The present invention provides for a unique microchip or circuit which can, *inter alia*, handle both current conducting functions and man–machine–interface functions in an electrical device, for example, such as a flashlight. The man–machine–interface functions, according to the present invention, may be controlled by very low current signals, touch pads, carbon coated membrane type switches, or other low current type switches. These low current switches are smaller, more reliable, less costly, easier to seal, and less vulnerable to corrosion and xidation than prior art switches. Moreover, since according to the present invention, the current conducting switch is controlled in an intelligent manner by the same microchip which provides the man–machine–interface functioning, significant costs savings and reliability are achieved by the invention. The present invention, according to one embodiment, also provides a microchip or circuit which may be embedded into a power source, for example, a battery, that supplies intelligence to the same. As a result, and according to the invention, functions such as delayed switching, dimming, delayed automatic shut off and an intermittent activation may be realized in less intellligent prior art electrical devices. According to certain embodiments of the present invention, the inventive microchips or circuits of the present invention can, *inter alia*, adjust the average electrical current through a current switch , provide an "on" and "off" sequence which, in the case of a flashlight, can be determined by an operator and may represent either a flash code sequence or a simple on–off oscillation, delayed shut off function, dimming function, provide indication of power strength, and provide gradual oscillating current flow to lengthen the life of the operating switch and the battery, etc. The function can be selected by varying the time period which elapses between successive activations of a controlling switch.

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EE	Estonia	**LR**	Liberia	**SG**	Singapore		

INTERNATIONAL SEARCH REPORT

International Application No
PCT/ZA 99/00107

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H05B37/00 H05B41/30 H05B41/32 G08B21/00 H01M10/48

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H05B G08B H01M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, IBM-TDB, INSPEC, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 32 25 557 A (TELEFUNKEN ELECTRONIC GMBH) 19 January 1984 (1984-01-19) page 1, line 3-6	1,2,5,8, 14,15, 17,46
A	page 3, line 26 -page 6, line 27; claims 1-16; figures 1,2	3,4,6,7, 9-13,16, 18,19
X	US 5 005 004 A (UDOFOT MICHAEL P) 2 April 1991 (1991-04-02)	1,46
A	column 1, line 1-63 column 8, line 5-28; figures 1,2	2-19

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 July 2000	07.08.00

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Pierron, P

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International Application No
PCT/ZA 99/00107

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 1996, no. 07, 31 July 1996 (1996-07-31) & JP 08 062681 A (OLYMPUS OPTICAL CO LTD), 8 March 1996 (1996-03-08) abstract	1
X	DE 40 14 737 A (FRAUNHOFER GES FORSCHUNG) 15 November 1990 (1990-11-15)	20-23, 27-31, 35,36, 40-45
A	column 1, line 6 -column 2, line 8 column 10, line 45 -column 12, line 68; claims 1-16; figures 1-5	24-26, 32-34, 37-39
X	WO 92 22099 A (MOTOROLA INC) 10 December 1992 (1992-12-10)	20-23, 27-31, 35,36, 40-45
A	page 1, line 20 -page 2, line 17 page 5, line 1 -page 9, line 20; claims 1-10; figures 1-5	24-26, 32-34, 37-39

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ZA 99/00107

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-19, 46

   An intelligent flashlight

2. Claims: 20-30, 44

   An intelligent battery

3. Claims: 31-40

   A portable microchip device

4. Claims: 41-43, 45

   An intelligent portable electrical device

INTERNATIONAL SEARCH REPORT

Information on patent family members

Inter[illegible]nal Application No
PCT/ZA 99/00107

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 3225557 A	19-01-1984	GB 2125975 A,B	14-03-1984
		JP 1797619 C	28-10-1993
		JP 5005089 B	21-01-1993
		JP 59023331 A	06-02-1984
		US 4483605 A	20-11-1984
US 5005004 A	02-04-1991	NONE	
JP 08062681 A	08-03-1996	NONE	
DE 4014737 A	15-11-1990	AT 94651 T	15-10-1993
		AU 5555790 A	29-11-1990
		WO 9013823 A	15-11-1990
		DE 59002764 D	21-10-1993
		EP 0471698 A	26-02-1992
		ES 2045915 T	16-01-1994
		JP 4505660 T	01-10-1992
		US 5349540 A	20-09-1994
WO 9222099 A	10-12-1992	US 5206097 A	27-04-1993
		EP 0587722 A	23-03-1994
		JP 6507998 T	08-09-1994

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

15

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
P.18703/MAJR		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/ZA99/00107	08/10/1999	09/10/1998
International Patent Classification (IPC) or national classification and IPC H05B41/00		
Applicant BRUWER, Frederick, Johannes		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 6 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
03/05/2000	24.11.2000
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Pierron, P Telephone No. +49 89 2399 2518

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/ZA99/00107

I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).)*:
Description, pages:

1-20 as originally filed

Claims, No.:

1-14 filed during a personal consultation on 16/11/2000

Drawings, sheets:

1/6-6/6 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-14
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-14
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-14
	No:	Claims	

2. Citations and explanations
   see separate sheet

The invention relates to an electrical device for use with exhaustible power source and a light source which is powered by the said power source, said device inducing at least, one signal switch and a microchip in communication with the signal switch and the power source.

The subject matter of claim 1 differs from the prior art given on pages of the description in that the signal switch is a non-energy transferring MMI signal switch, and said signal switch not being a serial part of an energy transfer circuit from the power source to the load, and in that the microchip includes means for convolving an on/off function between the power source and the light source, and means for providing at least one of the following in response to the receipt of at least one signal from the signal switch:
(a) a delayed shut oft function and
(b) a find-in-the-dark function by activating an indicator.

Consequently, claim 1 meets the requirements of article 33 (2) and 33 (3) PCT.

TENT COOPERATION TRE.

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Assistant Commissioner for Patents
United States Patent and Trademark Office
Box PCT
Washington, D.C.20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 07 June 2000 (07.06.00)	
International application No. PCT/ZA99/00107	**Applicant's or agent's file reference** P.18703/MAJR
International filing date (day/month/year) 08 October 1999 (08.10.99)	**Priority date** (day/month/year) 09 October 1998 (09.10.98)
Applicant BRUWER, Frederick, Johannes	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

03 May 2000 (03.05.00)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO **34, chemin des Colombettes** **1211 Geneva 20, Switzerland**	Authorized officer Diana Nissen
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and Administrative Instructions, Section 422)

To:

McCALLUM RADEMEYER & FREIMOND
P.O. Box 1130
2125 Randburg
AFRIQUE DU SUD

Date of mailing (day/month/year) 06 April 2001 (06.04.01)	
Applicant's or agent's file reference P.18703/MAJR	**IMPORTANT NOTIFICATION**
International application No. PCT/ZA99/00107	**International filing date** (day/month/year) 08 October 1999 (08.10.99)

1. The following indications appeared on record concerning:

[X] the applicant [ ] the inventor [ ] the agent [ ] the common representative

Name and Address	State of Nationality	State of Residence
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

[X] the person [ ] the name [ ] the address [ ] the nationality [ ] the residence

Name and Address	State of Nationality	State of Residence
AZOTEQ (PTY) LIMITED 109 Main Street Paarl 7646 South Africa	ZA	ZA
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

3. Further observations, if necessary:
Addition of an Applicant for the purposes of all designated States except the US. BRUWER, Frederick,Johannes is Applicant/Inventor for the US only.

4. A copy of this notification has been sent to:

[X] the receiving Office
[ ] the International Searching Authority
[ ] the International Preliminary Examining Authority
[ ] the designated Offices concerned
[X] the elected Offices concerned
[ ] other:

The International Bureau of WIPO **34, chemin des Colombettes** **1211 Geneva 20, Switzerland**	Authorized officer Sean Taylor
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38